

Remarks/Arguments:

Claims 1-8 are pending in the application.

Claims 1, 5, 7 have been amended to replace "hydrocarbon feedstock" with "natural gas liquid." Similarly, claim 8 has been amended to replaced "hydrocarbon feed" and "hydrocarbon stream" with "natural gas liquid." Support for the amended claims can be found, for example, in the originally filed application at page 1, lines 7 and 20. No new matter has been added.

Claims 1-3 and 5-8 stand rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent No. 5,595,634 ("Hearn") in view of U.S. Patent Application Publication No. 2002/0130062 ("Wismann"). Claim 4 stands rejected under 35 U.S.C. § 103 (a) as unpatentable over Hearn in view of Wismann and U.S. Patent No. 3,839,192 ("Hayes"). Applicant respectfully submits that the currently pending claims, as amended, are patentable over the cited references for at least the reasons set forth below.

Features of the Claims

Applicant's invention, as recited in independent claim 1, includes the following features which are neither disclosed nor suggested by the cited references, namely:

introducing sufficient oxygen into said natural gas liquid to oxidise the mercaptans therein and

subjecting the resultant mixture to the fractional distillation in a column including at least one bed of a catalyst capable, under the prevailing conditions, of oxidising mercaptans to higher boiling point sulphur compounds (emphasis added).

Response to Rejections

The Office rejects independent claim 1 as obvious over Hearn in view of Wismann. Specifically, the Office asserts that Hearn discloses all of the features of Applicant's claimed invention, except that Hearn discloses a hydrogen stream to be used instead of the oxygen as in the claimed invention. The Office, however, asserts that it would have been obvious to one of ordinary skill in the art to use oxygen containing gas or oxygen, "since it was known in the art that oxygen could be used to convert effectively a mercaptan to a disulfide," as allegedly evidenced by Wismann (Office Action, page 3).

Applicant submits that Hearn discloses a catalytic distillation process in which mercaptans and diolefins present in a hydrocarbon stream are reacted over a nickel, cobalt or iron catalyst in the presence of hydrogen to form sulphides (See e.g. Hearn, at col. 7, line 20). Oxygen is therefore not added, as the Office concedes. In addition, Applicant submits that the catalyst "under the prevailing conditions" is also not capable of performing an oxidation reaction. In fact, as one of ordinary skill in the art would recognize, hydrogen is a reducing gas and the nickel, cobalt or iron catalyst would thus be in a reduced state.

Regarding Wismann, Applicant submits that Wismann describes a process for the removal of mercaptans sulphur from petroleum distillates by sorption or simultaneous sorption and oxidation over activated carbon. The process, according to Wismann, may be used in petroleum refining for the demercaptanization of gasoline, kerosene and diesel fractions (See e.g., Wismann, at page 1, para. 0002). Wismann does not, however, consider the separation of propane and/or butanes from a natural gas liquid contaminated with alkyl mercaptans by fractional distillation.

Applicant respectfully submits that the combination of Hearn and Wismann fails to teach, disclose or suggest all of the features of amended independent claim 1. Among the criteria for establishing a *prima facie* case of obviousness is that all claim limitations must be taught or suggested by the prior art. M.P.E.P. § 2143.03 (citing *In re Rozka*, 490 F.2d 981, 180 USPQ 580 (C.C.P.A. 1974)). Here, as noted above, even if combined, Applicant submits that neither Hearn nor Wismann disclose or suggest the separation of propane and/or butanes from a natural gas liquid contaminated with alkyl mercaptans by fractional distillation including the step of introducing sufficient oxygen into the natural gas to oxidise the mercaptans.

Moreover, according to the "Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of the Supreme Court Decision in *KSR International v. Teleflex Inc.*," at Section V as published in the Federal Register, Vol. 72, No. 195 at page 57534, "in the case of a claim to a combination, applicants may submit evidence or argument to demonstrate that: (1) *one of ordinary skill in the art could not have combined the claimed elements by known methods (e.g. due to technological difficulties)*. . . ." (emphasis added). "Once the applicant has presented rebuttal evidence, Office personnel should reconsider any initial obviousness determination in view of the entire record." *Id.* at 57535. Furthermore, according to the M.P.E.P., if the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the

proposed modification. M.P.E.P. § 2143.01(V) (citing *In re Gordon*, 733 F.2d 900, 221 U.S.P.Q. 1125 (Fed. Cir. 1984)). Applicant submits that one of ordinary skill in the art would not simply add the oxygen of Wismann as a substitute for the hydrogen in the process of Hearn, because one of ordinary skill in the art could not have combined the references' teachings as alleged by the Office, and because such a combination would indeed render Hearn unsatisfactory for its intended purpose.

By combining Hearn and Wismann, the Office has sought to attempt to arrive at the features of the claims. Applicant submits, however, that this combination is flawed because the feedstocks in Hearn and Wismann are different and, as such, would present different challenges in terms of sulphur removal. Applicant submits that it would not be simply the replacement of Wismann's oxygen for Hearn's hydrogen in the Hearn process.

Specifically, Applicant submits that the processes of Hearn and Wismann would not be combined by one of ordinary skill in the art as suggested by the Office because the process of Hearn requires the presence of diolefins in the feed to achieve the desired sulphide forming reaction. Applicant submits that the presence of diolefins in the feed requires that an oxygen-free route be used. This is because diolefins react with oxygen to form gums. (See e.g., Hearn at col. 5, lines 4-6). Gums, however, are undesirable because they can block distillation apparatus. The combination of Hearn and Wismann, therefore, would be incompatible and render the Hearn process unfit for its intended purpose.

In contrast, Applicant's invention, as claimed in amended claim 1, requires a natural gas liquid. Natural gas, and hence natural gas liquids, are "predominantly saturated" (see e.g., present application at page 1, line 4). Therefore, in the process of the present invention the addition of oxygen does not present difficulties with gum formation.

Accordingly, the Office has failed to establish a *prima facie* case of obviousness. Applicant submits, therefore, that claim 1 is patentable over the combination of Hearn and Wismann. Furthermore, dependent claims 2-8 are also patentable over Hearn and Wismann for at least the reasons that claim 1 is patentable.

Notwithstanding the above, with respect to claim 4, Applicant submits that the Office's reliance on Hayes for the disclosure of granular material comprising copper sulphates, sodium chloride and water on a clay support, as alleged by the Office, fails to make up for the

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deficiencies of the combination of Hearn and Wismann, as noted above. Applicant submits, therefore, that claim 4 is patentable over Hearn in combination with Wismann and Hayes.

Conclusion

In view of the amendments and arguments as set forth above, Applicant submits that the currently pending application is in condition for allowance. Notice to this effect is earnestly solicited.

Respectfully submitted,



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